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Kim et al.

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(54) **WASHING MACHINE**

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(30) **Foreign Application Priority Data**

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D06F 37/20 (2006.01)

(52) **U.S. Cl.** **68/23.1**; 68/12.06; 68/12.02

(58) **Field of Classification Search** 68/12.02, 68/12.06, 12.27, 12.24, 23.1
See application file for complete search history.

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(57) **ABSTRACT**

A washing machine having a vibration sensing assembly for sensing a transient vibration of a tub. The vibration sensing assembly includes a fixing part fixed to an inner wall of a cabinet, a rotational part rotatably connected to the fixing part to perform a rotational movement within a predetermined range by the vibration of a tub centering around a portion connected to the fixing part, and a sensor provided to the rotational part to sense the rotational movement of the rotational part.

18 Claims, 7 Drawing Sheets

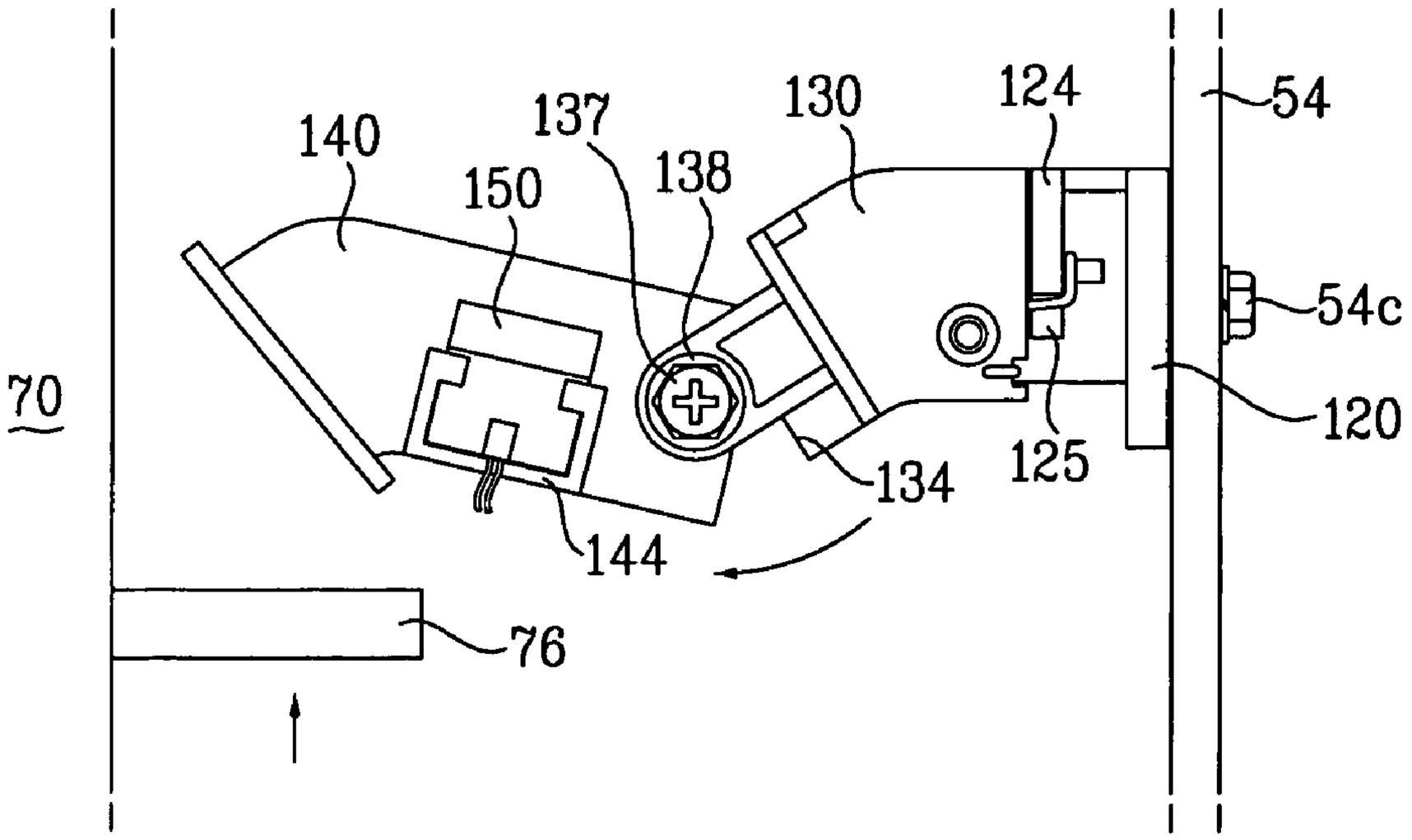


FIG. 1
PRIOR ART

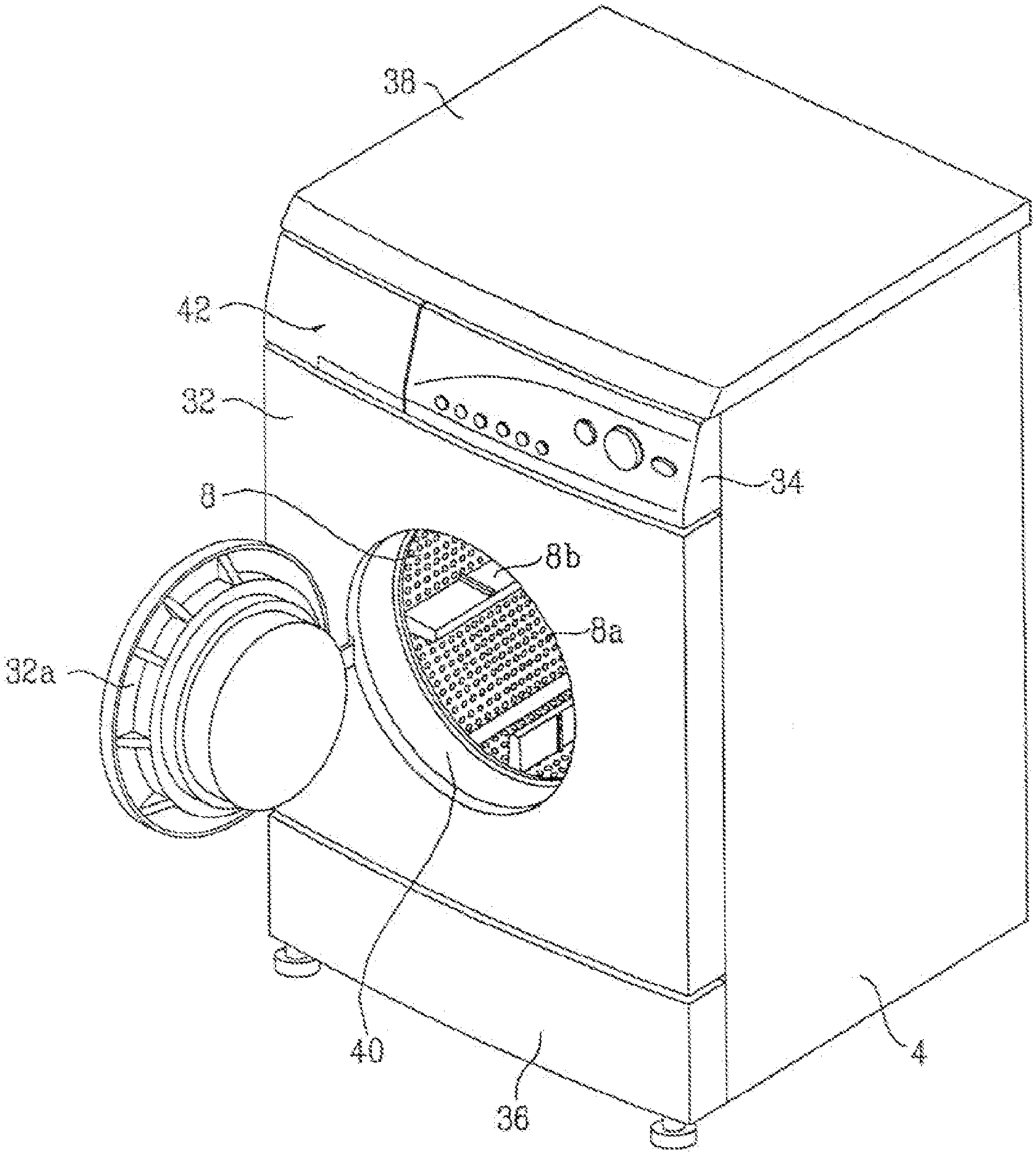


FIG. 2
PRIOR ART

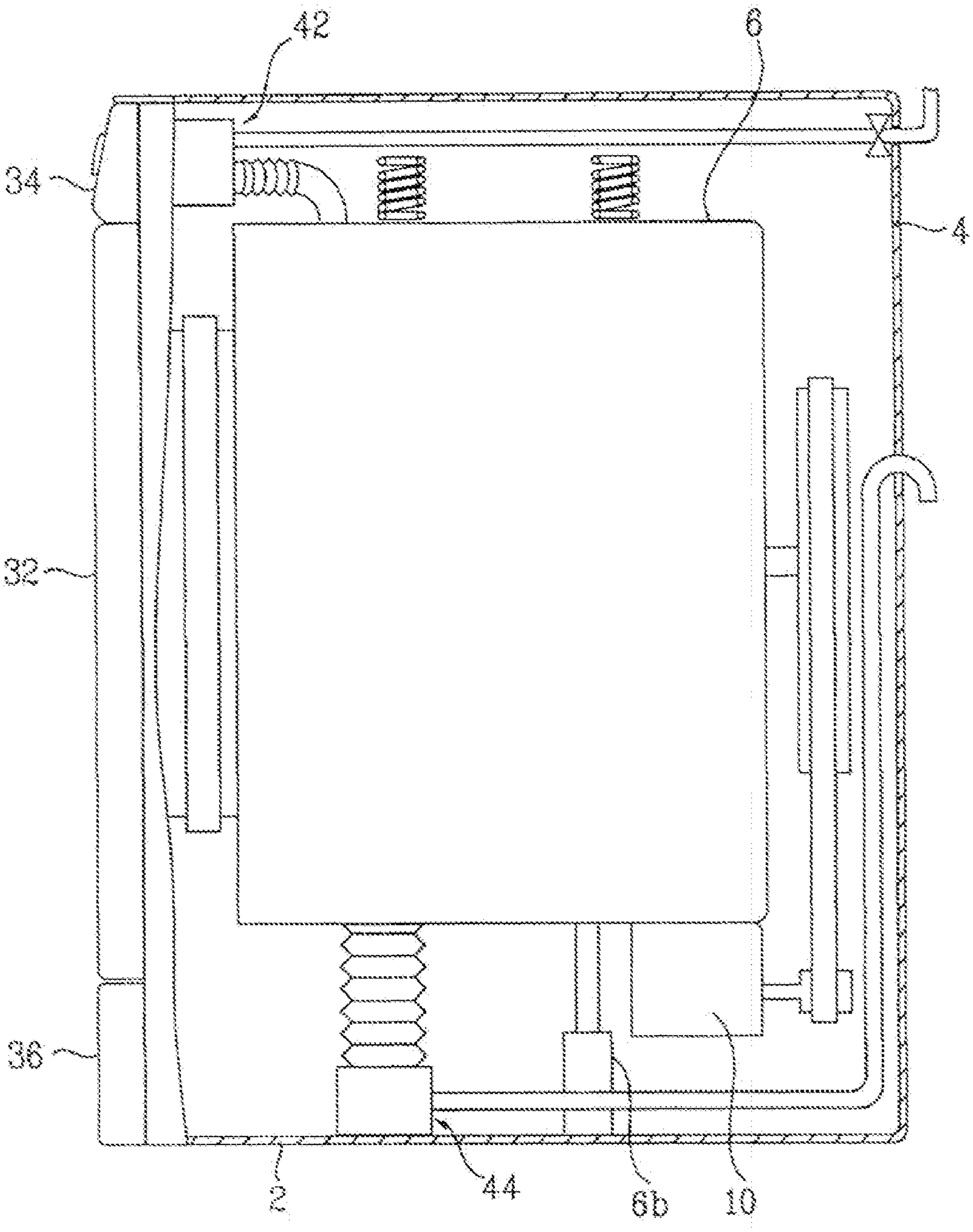


FIG. 3

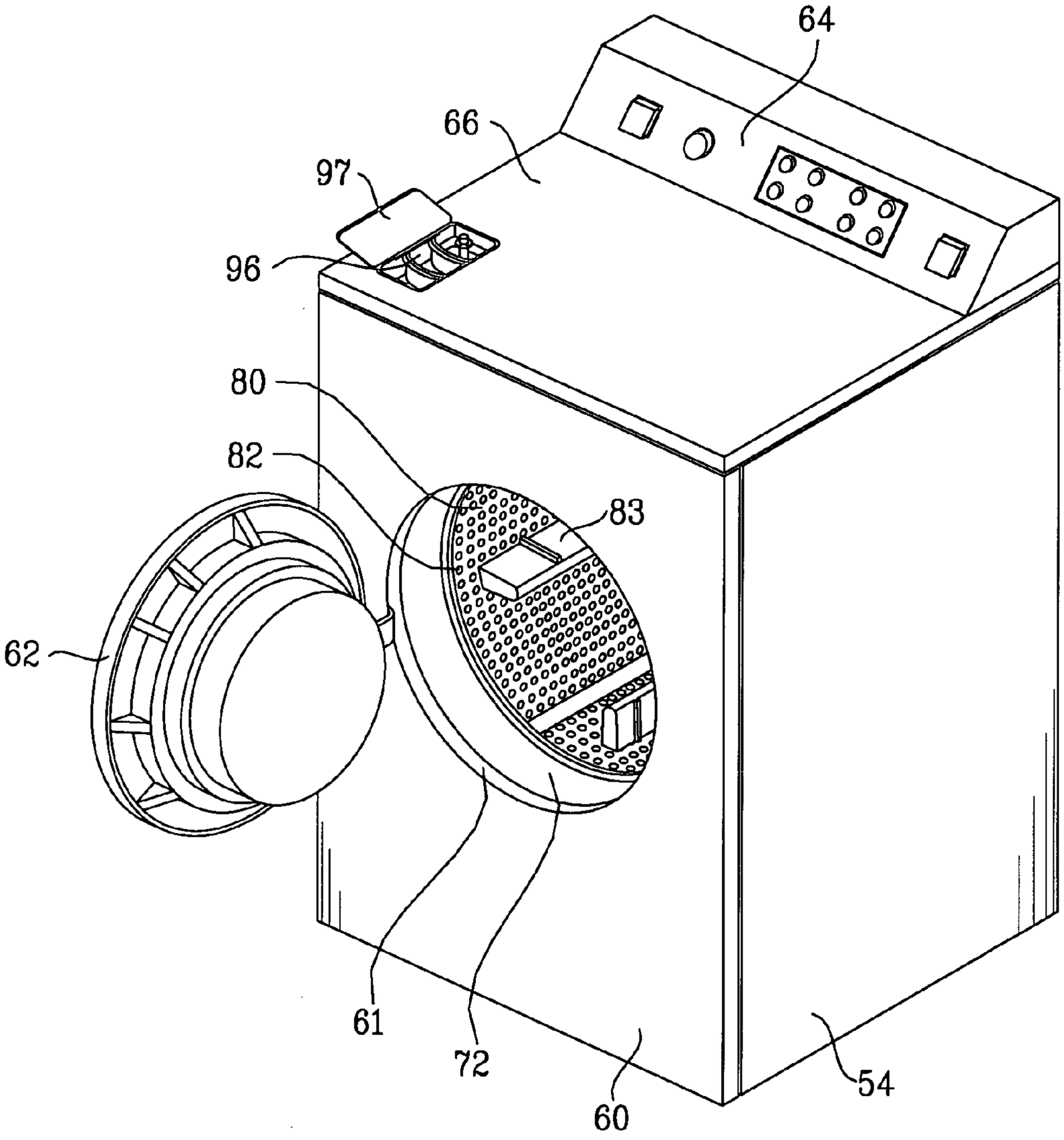


FIG. 4

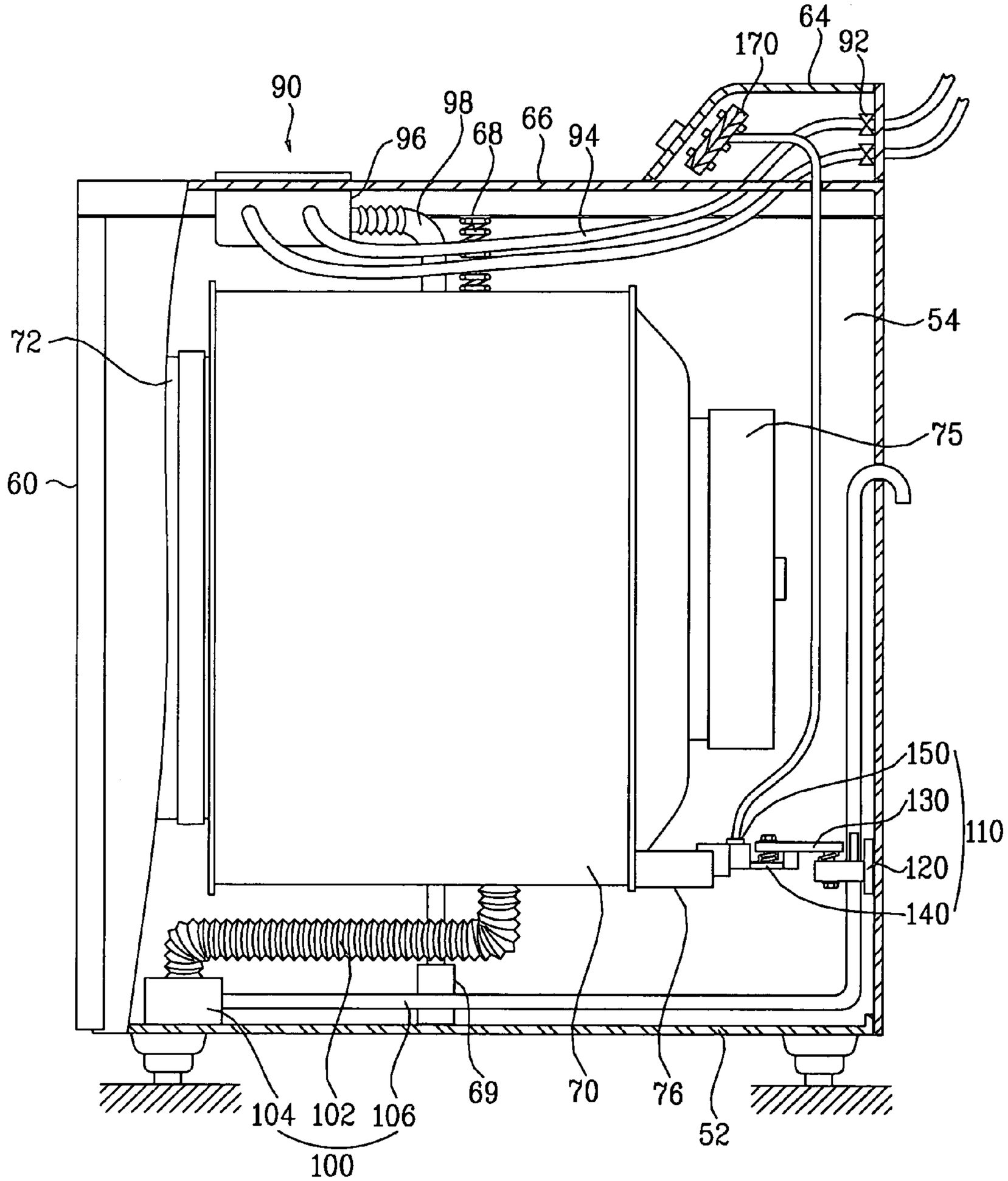

64
170
92
90
98
96
68
66
94
54
72
75
60
150
130
110
120
140
69
70
76
104
102
106
52
100

FIG. 5

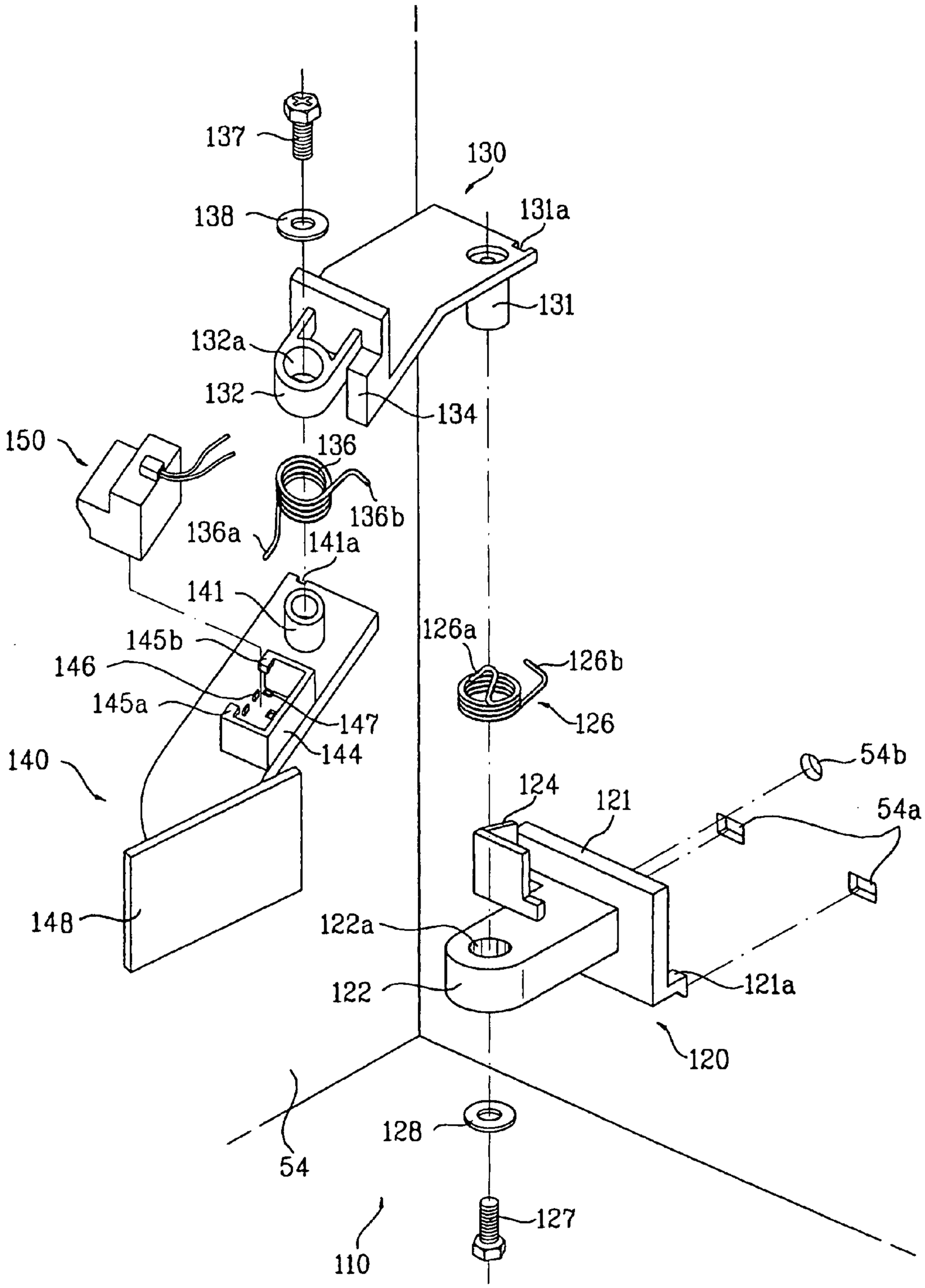

137
138
130
131a
131
132a
132
134
150
136
136b
136a
141a
141
145b
146
145a
147
144
140
148
126a
126b
126
124
121
54b
54a
122a
122
121a
120
54
128
127
110

FIG. 6

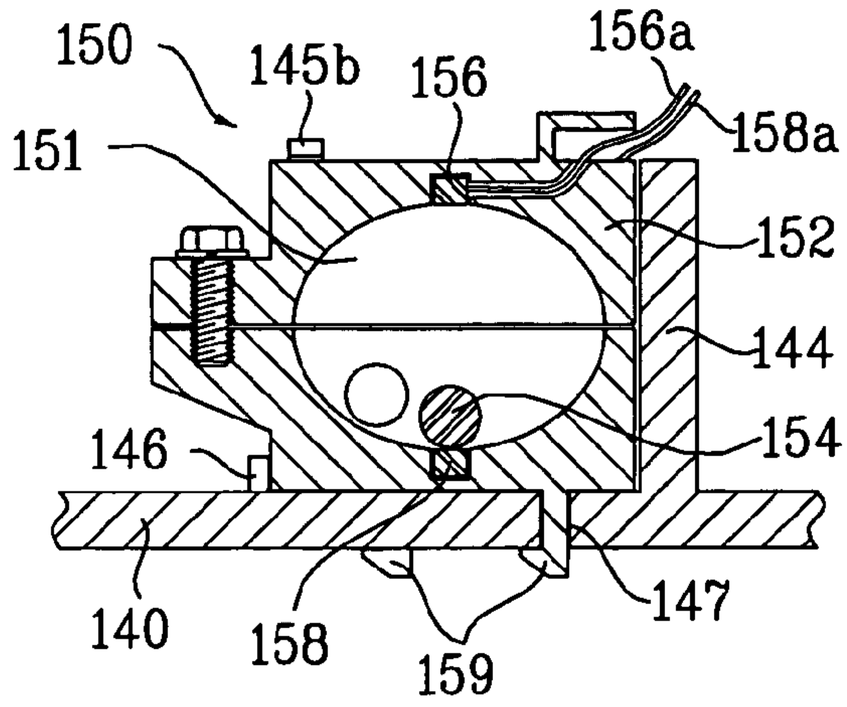

150
145b
156
156a
158a
151
152
144
154
146
140
158
159
147

FIG. 7

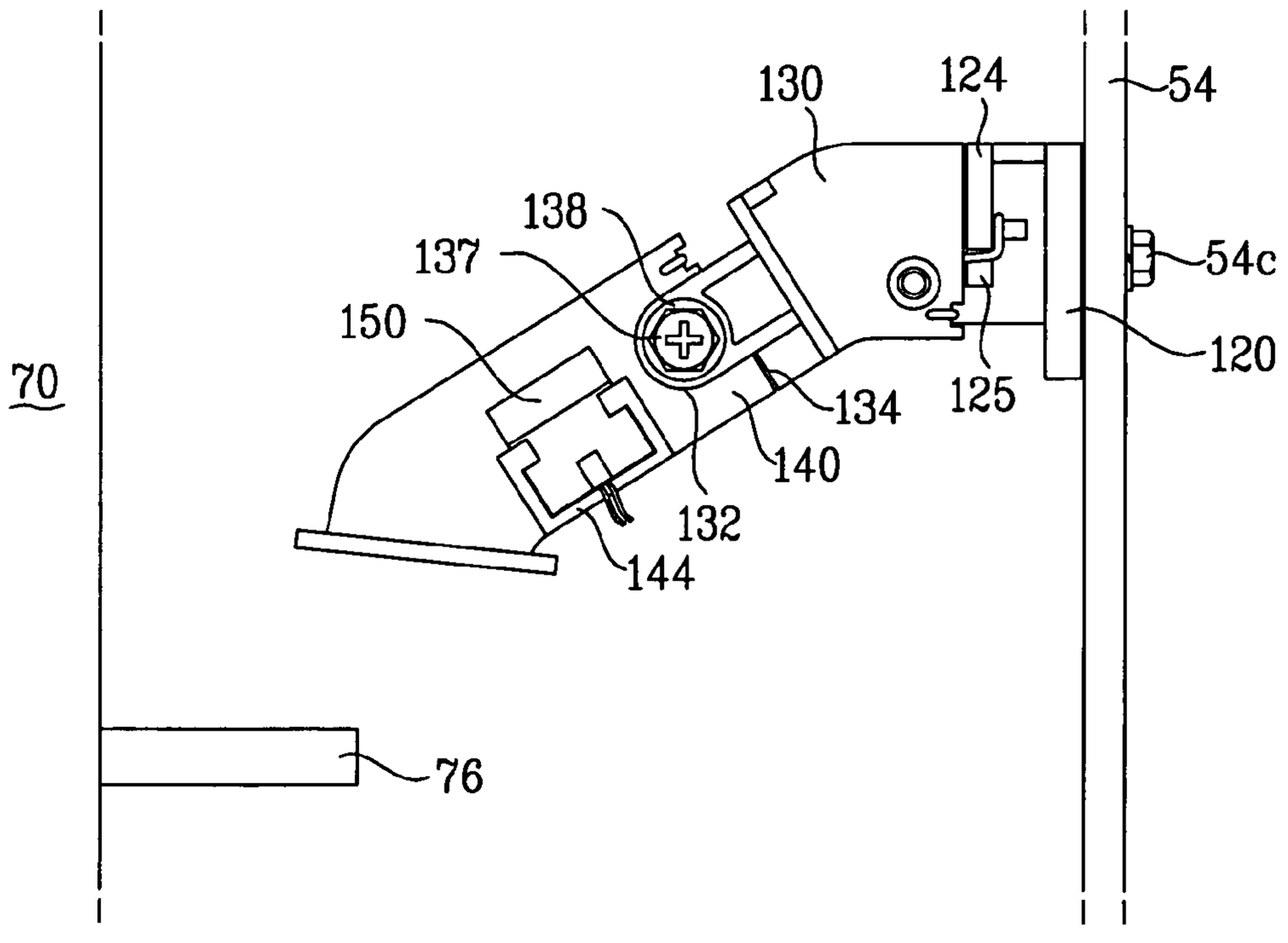

130
124
54
138
137
150
54c
120
125
134
140
132
144
70
76

FIG. 8

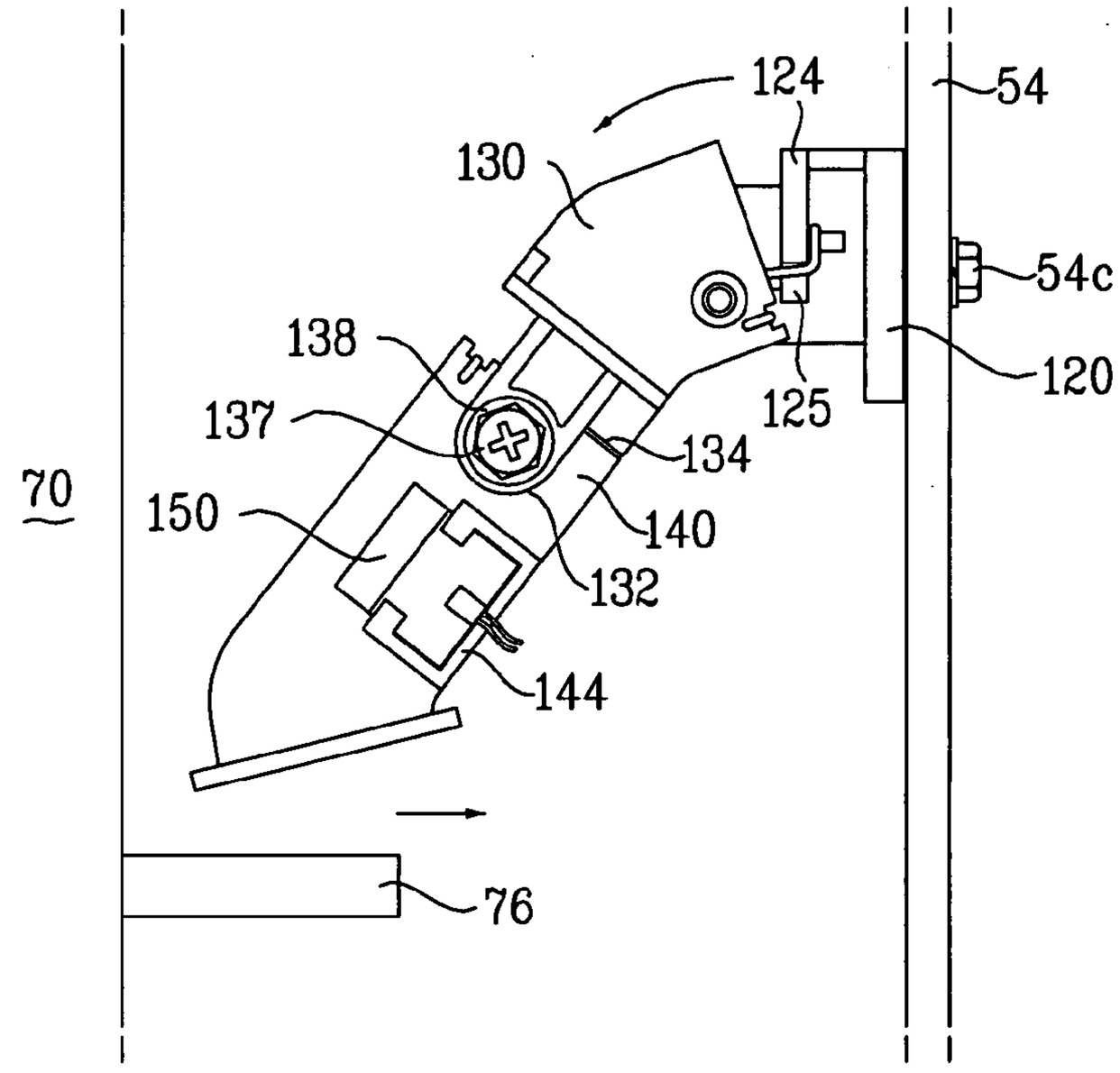
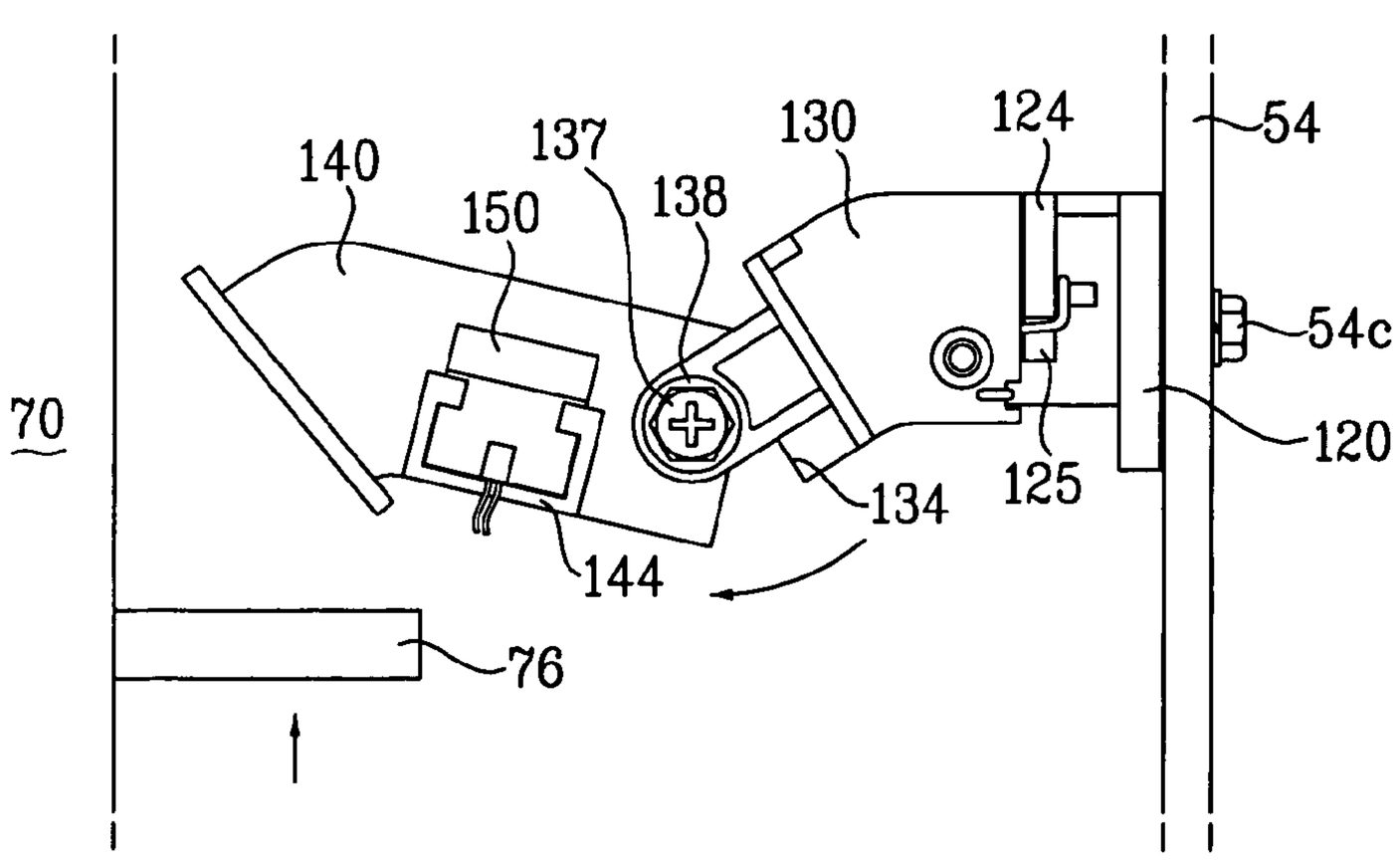

124
54
130
54c
138
120
137
125
134
70
150
140
132
144
76

FIG. 9


140
137
130
124
54
150
138
54c
70
120
125
134
144
76

WASHING MACHINE

This application claims the benefit of Korean Application(s) No. 10-2002-0075028 filed on Nov. 28, 2002 which is/are hereby incorporated by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a washing machine, and more particularly, to a washing machine having an assembly for sensing a transient vibration of a tub.

2. Discussion of the Related Art

Generally, water and detergent are held in a tub of a drum type washing machine and a laundry is put in a drum inside the tub. The drum is then rotated to perform washing, rinsing, and dewatering.

FIG. **1** is a perspective view of a general drum type washing machine and FIG. **2** is a cross-sectional view of a general drum type washing machine.

Referring to FIG. **1** and FIG. **2**, a general washing machine consists of a base **2**, a cabinet body **4** provided on the base **2** to have an open front side, a tub **6** provided in the cabinet body **4** to hold water or detergent, a drum **8** rotatably provided in the tub **6**, a motor **10** rotating the drum **8**, a cabinet cover **32** provided to the front side of the cabinet body **4** to have a laundry entrance at a central part, a control panel **34** provided over the cabinet cover **32** to control the washing machine, a lower cover **36** provided under the cabinet cover **32**, a top plate **38** provided over the cabinet cover **4**, a gasket **40** provided between the tub **6** and the entrance, an inlet assembly **42** for supplying water or detergent to the tub, and a drain assembly **44** for discharging the used water in the tub **6** outside the washing machine.

The top and bottom of the tub **6** are supported by springs **6***a* and dampers **6***b* attenuating vibrations, respectively. The drum **8** holds water inside. A multitude of perforated holes **8***a* are formed at a circumference of the drum **8**, and a plurality of lifts **8***b* lifting up the laundry to fall are installed on an inner circumference of the drum **8**.

A door **32***a* that is revolvable is installed at the cabinet cover **32** to open/close the laundry entrance.

However, in the above-constituted general washing machine, the laundry inside the drum **8** is entangled while a washing, rinsing, or dewatering step is in progress. In such a case, a transient vibration appears on the tub **6** to hit an inside of the cabinet **4**.

Hence, the washing machine makes noise, the cabinet **4** or the tub **6** may be broken, and the washing machine rocks right and left or back and forth.

To overcome such problems, many efforts are made to develop of a new washing machine having a vibration sensing assembly for preventing the transient vibration of the tub.

SUMMARY OF THE INVENTION

Accordingly, the present invention is directed to a washing machine having a vibration sensing assembly for sensing a transient vibration of a tub that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

An object of the present invention, which has been devised to solve the foregoing problem, lies in providing a washing machine having a vibration sensing assembly for sensing a transient vibration of a tub, by which shaking and noise, which may be caused by the transient vibration of the tub, of the washing machine is prevented.

Additional features and advantages of the invention will be set forth in the description which follows, and in part will be apparent to those having ordinary skill in the art upon examination of the following or may be learned from a practice of the invention. The objectives and other advantages of the invention will be realized and attained by the subject matter particularly pointed out in the specification and claims hereof as well as in the appended drawings.

To achieve these objects and other advantages in accordance with the present invention, as embodied and broadly described herein, there is provided a washing machine including a tub having an open front side, a drum rotatably provided in the tub to hold laundry, a motor rotating the drum, a cabinet having the tub and the motor inside, a control unit controlling a vibration of the tub, and a vibration sensing assembly for sensing the vibration of the tub.

The vibration sensing assembly includes a fixing part fixed to an inner wall of the cabinet, a rotational part rotatably connected to the fixing part to perform a rotational movement within a predetermined range by the vibration of the tub centering around a portion connected to the fixing part, and a sensor provided to the rotational part to sense the rotational movement of the rotational part.

The fixing part includes a fixing body fixed to the inner wall of the cabinet, a first rotational connecting portion connected in one body to the fixing body and rotatably connected to one side of the rotational part, and a first stopper provided to interrupt the rotational movement of the rotational part so that the rotational part performs the rotational movement within the predetermined range only.

The first rotational connecting portion includes an insertion hole in which a rotational center of the rotational part is inserted.

The fixing part preferably further includes a first elastic member returning the rotational part to an original position. In this case, the first elastic member includes a first coil spring having one end connected to the fixing body or the first stopper and the other end connected to the rotational part.

And, the fixing body is fixed to the inner wall of the cabinet by at least one hook.

The rotational part includes a second rotational connecting portion rotatably connected to the first rotational connecting portion of the fixing part to be a rotational center and a rotational body having one end connected to the second rotational connecting portion to rotate according to the vibration of the tub centering around the second rotational connecting portion.

The rotational body includes a vibration transferring portion provided to an opposite side of the second rotational connecting portion to transfer the vibration of the tub to the rotational body.

The rotational body includes a first rotational body having one side rotatably connected to the second rotational connecting portion and a second rotational body having one side connected to the other side of the first rotational body and the other side having the vibration transferring portion.

The first rotational body includes a second stopper having the second rotational body rotate within a predetermined range and a third rotational connecting portion to which one side of the second rotational body is rotatably connected.

Preferably, the first rotational body further includes a second elastic member returning the second rotational body to its original position.

The second elastic member includes a second coil spring having one end connected to the second stopper and the other end connected to the second rotational body.

The second rotational body includes a fourth rotational connecting portion connected to the third rotational connecting portion to become a rotational center and a sensor receiving portion receiving the sensor therein.

In this case, the sensor receiving portion is provided to an upper surface of the second rotational body.

The sensor includes a ball type rolling body moving in a reverse direction of a movement of the rotational body according to the vibration of the tub, a case providing a space for holding the rolling body, and a movement sensing unit for sensing a movement of the rolling body.

A vertical cross-section of the inner space of the case is circular or oval.

The movement sensing unit includes a signal transmitting part provided to one side of an inner wall of the case and a signal receiving part provided to the other side confronting the signal transmitting part to receive a signal transmitted from the signal transmitting part.

The vibration sensing assembly can be coupled to the inner wall of a rear side of the cabinet in rear of the tub.

Preferably, the tub includes a protruding plate provided in the vicinity of a lateral side of the rotational par, the protruding plate protruding in a rear direction to transfer a right-to-left vibration of the tub to the rotational part.

It is to be understood that both the foregoing explanation and the following detailed description of the present invention are exemplary and illustrative and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate embodiment(s) of the invention and together with the description serve to explain the principle of the invention. In the drawings:

FIG. **1** is a perspective view of a general drum type washing machine;

FIG. **2** is a cross-sectional view of a general drum type washing machine;

FIG. **3** is a perspective view of a drum type washing machine according to the present invention;

FIG. **4** is a cross-sectional view of a drum type washing machine according to the present invention;

FIG. **5** is a perspective view of a disassembled vibration sensing assembly of a washing machine according to the present invention;

FIG. **6** is a cross-sectional view of a sensor provided to a washing machine according to the present invention;

FIG. **7** is a side view of a vibration sensing assembly of a washing machine according to the present invention before a vibration is transferred from a tub;

FIG. **8** is a side view of a vibration sensing assembly of a washing machine according to the present invention when front and rear vibrations are transferred from a tub; and

FIG. **9** is a side view of a vibration sensing assembly of a washing machine according to the present invention when right and left vibrations are transferred from a tub.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

Reference will now be made in detail to the preferred embodiment(s) of the present invention, examples of which are illustrated in the accompanying drawings. Throughout the drawings, like elements are indicated using the same or similar reference designations where possible.

FIG. **3** is a perspective view of a drum type washing machine according to the present invention and FIG. **4** is a cross-sectional view of a drum type washing machine according to the present invention.

Referring to FIG. **3** and FIG. **4**, a washing machine according to the present invention includes a cabinet, a tub **70** provided in the cabinet to hold water and having an open front side, a drum **80** rotatably provided in the tub, a motor **75** in rear of the tub **70** to rotate the drum **80**, a spring **68** provided over the tub **70** to attenuate a vibration of the tub **70**, a damper **69** provided under the tub **70** to attenuate the vibration of the tub **70**, an inlet assembly **90** supplying water or detergent to the tub **70**, a drain assembly **100** discharging the water in the tub **70** outside the washing machine, a vibration sensing assembly **110** for sensing a transient vibration of the tub **70**, and a control unit **170** controlling to drive the motor **75**, inlet assembly **90**, and drain assembly **100** and controlling to drive the motor **75** in case that the transient vibration of the tub **70** is sensed.

A multitude of perforated holes **82** are formed at the drum **80** to communicate with the tub **70**, and a plurality of lifts **83** lifting up the laundry to fall are installed on an inner circumference of the drum **80**.

The cabinet includes a base **52**, a cabinet body **54** provided on both lateral sides and a rear side of the base **52**, a cabinet cover **60** provided to a front side of the cabinet body **54**, and a top plate **66** provided over the cabinet body **54**.

A laundry entrance **61** is formed at a central part of the cabinet cover **60**, and a door **62** is installed at the cabinet cover **60** to open/close the laundry entrance **61**.

A gasket **72** is installed between the laundry entrance **61** and the tub **70** to prevent water leakage and laundry jamming on operating the washing machine.

A control panel **64** for controlling an operation of the washing machine is installed on a rear part of the top plate **66**.

The inlet assembly **90** includes an inlet valve **92** provided in the top plate **66** to switch a water supply by the control unit **170**, an inlet hose **94** guiding water flowing out of the inlet valve **92**, a detergent box **96** mixing the water guided by the inlet hose **94** with a detergent to discharge, and an inlet bellows **98** leading the water or detergent discharged from the detergent box **96** to the tub **70**. A cover **97** covers the detergent box **96**.

The drain assembly **100** includes a drain bellows **102** guiding the water discharged from the tub **70**, a drain pump **104** pumping the water guided by the drain bellows **102**, and a drain hose **106** guiding the water pumped by the drain pump **104** outside.

And, the vibration sensing assembly **110** includes a fixing part **120** fixed to an inner wall of the cabinet body **54**, a rotational part (not shown in the drawing) rotatably connected to the fixing part **120** to perform a rotational movement within a predetermined range by a vibration of the tub, and a sensor **150** provided to the rotational part to sense the rotational movement of the rotational part.

In this case, one end of the vibration sensing assembly **110** is fixed to an inner wall of a rear side of the cabinet in rear of the tub.

The fixing part **120**, as shown in FIG. **5**, includes a fixing body **121** fixed to the inner wall of the rear side of the cabinet, a first rotational connecting portion **122** rotatably connected to one side of the rotational part, and a first stopper **124** provided to interrupt the rotational movement of the rotational part so that the rotational part performs the rotational movement within the predetermined range only.

The first stopper **124** allows the rotational part to rotate only within the predetermined range by a front-to-rear vibration of the tub.

The fixing body **121** includes a rectangular panel. Hooks **121***a* protrude from both sides of a lower rear side of the fixing body **121**, and hook holes **54***a* are formed at the rear side of the cabinet **54**. Hence the hooks **121***a* are inserted in the hook holes **54***a*, respectively to fix the fixing body **121** to the cabinet body **54**.

And, an upper part of the fixing body **121** is fixed by a locking member, e.g., screw, bolt, etc., penetrating a locking hole **54***b* formed at the cabinet.

An insertion hole **122***a* penetrating from an upper side to a lower side is formed at the first rotational connecting portion **122** so that a rotational center portion of the rotational part is inserted in the insertion hole **122***a* to rotate.

The rotational part includes a rotational body rotating according to the vibration of the tub **70** centering around a second rotational connecting portion **131** rotatably connected to the first rotational connecting portion of the fixing part **120**.

The rotational body includes a vibration transferring portion provided to an opposite side of the second rotational connecting portion to transfer the vibration of the tub to the rotational body.

The rotational body includes a first rotational body **130** having one side rotatably connected to the fixing part **120** and a second rotational body **140** having one side connected to the other side of the first rotational body and the other side having the vibration transferring portion (not shown in the drawing).

The second rotational connecting portion **131** connected to the first rotational connecting portion **122** is provided to the one side of the first rotational body. In this case, the second rotational connecting portion **131** has a shape having an outside diameter smaller than an inside diameter of the insertion hole **122***a*.

Moreover, the first rotational body **130** includes a second stopper **134** having the second rotational body **140** rotate within a predetermined range only and a third rotational connecting portion **132** to which one side of the second rotational body **140** is rotatably connected.

In this case, the second stopper **134** is provided to rotate within a predetermined range by a right-to-left vibration of the tub **70**.

The vibration transferring portion includes a side plate **148** transferring the right-to-left vibration of the tub.

Meanwhile, the second rotational body **140** includes a fourth rotational connecting portion **141** connected to the third rotational connecting portion **132** to become a rotational center and a sensor receiving portion receiving the sensor **150** therein.

In this case, the sensor receiving portion includes a receiving rib **144** protruding from an upper surface of the second rotational body **140** to have a cross-section of 'one side open rectangle'. Of course, the sensor receiving portion may be a recess formed at the upper surface of the second rotational body.

Hooks **145***a* and **145***b* are formed to confront each other on both sides of an upper end of the receiving rib **144** to fix the sensor **150**.

A holding protrusion **146** fixing a lower end of the sensor to prevent the sensor **150** from being separated from the receiving rib **144** is formed at the second rotational body **140**. And, a hook hole **147**, in which a hook **159** (see FIG. **6**) protruding from a bottom of the sensor **150** is inserted to be fixed thereto, is formed at the second rotational body **140**.

The third rotational connecting portion **132** has an insertion hole **132***a* penetrating from an upper side to a lower side, and the fourth rotational connecting portion **141**, which has a shaft shape having an outside diameter smaller than an inside diameter of the insertion hole **132***a*, is inserted in the insertion hole **132***a*.

The tub **70** protrudes in a rear direction to be provided in the vicinity of a side of the rotational part, and preferably includes a protruding plate **76** (see FIG. **4**) transferring the right-to left vibration of the tub to the side plate **148**.

Preferably, a first coil spring **126** is installed at a portion, where the first and second rotational connecting portions **122** and **131** are connected, to absorb a shock applied to the first rotational body **130** by the tub **70** and to return the rotated rotational part to be brought contact with the first stopper **124**.

In this case, for installation of the first coil spring **126**, one end **126***a* of the first coil spring **126** is fixed to a fixing recess **131***a* at the first rotational body **130**, the other end **126***b* of the first coil spring **126** is connected to the first stopper **124** to be fixed thereto, and the second rotational connecting portion **131** is inserted in the first coil spring **126** in an axial direction.

A first bolt **127** is screwed in an inner circumference of the second rotational connecting portion **131** via the first rotational connecting portion **122**. In this case, a first washer **128** is inserted between a head of the first bolt **127** and a bottom of the second rotational connecting portion **131** to prevent separation of the second rotational connecting portion. The first washer **128** has an outside diameter greater than an inside diameter of the first rotational connecting portion **122**.

Moreover, a second coil spring **136** is installed at a portion, where the third and fourth rotational connecting portions **132** and **141** are connected, to absorb a shock applied to the second rotational body **140** when the tub **70** or the protruding plate **76** transfers the vibration to the second rotational body **140** and to return the rotated second rotational body **140** to its original position, i.e., to return the rotated second rotational body **140** to be brought contact with the second stopper **124**.

In this case, for installation of the second coil spring **136**, one end **136***a* of the second coil spring **136** is fixed to a hanging recess **141***a* at the second rotational body **130**, the other end **136***b* of the second coil spring **136** is connected to the second stopper **134** to be fixed thereto, and the fourth rotational connecting portion **141** is inserted in the second coil spring **136** in an axial direction.

A second bolt **137** is screwed in an inner circumference of the fourth rotational connecting portion **141** via the third rotational connecting portion **132**. In this case, a second washer **138** is provided between a head of the second bolt **137** and a top of the third rotational connecting portion **141** to prevent separation of the fourth rotational connecting portion.

Referring to FIG. **6**, the sensor **150** includes a ball type rolling body **154** moving in a reverse direction of a movement of the rotational body according to the vibration of the

tub, a case **152** providing a space **151** for holding the rolling body, and a movement sensing unit for sensing a movement of the rolling body **154**.

A vertical cross-section of the inner space **151** of the case **152** is circular or oval.

The movement sensing unit includes a signal transmitting part **156** provided to one side of an inner wall of the case **152** and a signal receiving part **158** provided to the other side confronting the signal transmitting part to receive a signal transmitted from the signal transmitting part.

In the embodiment of the present invention, the signal transmitting part **156** is provided to a topside of the inner wall of the case and the signal receiving part **158** is provided to a bottom side of the inner wall of the case.

The rolling body **154**, which normally lies over the signal receiving part **158**, is unable to receive the signal transmitted from the signal transmitting part **156**. Yet, the rolling body **154** deviates from the normal position, i.e., a position over the signal receiving part **158**, in case of the transient vibration of the tub **70**, the signal receiving part **158** enables to receive the signal transmitted from the signal transmitting part **156** to transfer the received signal to the control unit **170**.

And, the signal transmitting and receiving parts **156** and **158** are connected to the control unit **170** via wires **156***a* and **158***a*, respectively.

An operation of the washing machine having the above-constructed vibration sensing assembly **110** is explained by referring to FIG. **7** to FIG. **9** as follows.

FIG. **7** is a side view of a vibration sensing assembly of a washing machine according to the present invention before a vibration is transferred from a tub, FIG. **8** is a side view of a vibration sensing assembly of a washing machine according to the present invention when front and rear vibrations are transferred from a tub, and FIG. **9** is a side view of a side view of a vibration sensing assembly of a washing machine according to the present invention when right and left vibrations are transferred from a tub.

First of all, a laundry is put in the drum **80** and the door **62** is then closed. Once the control panel **64** is operated to drive the washing machine, the detergent and water are supplied to the tub **70** from the inlet assembly **90**.

The control unit **170** drives the motor **75** to rotate the drum **80**, whereby the laundry is lifted up by the lifters **83** to fall for performing washing.

After completion of washing, the control unit **170** drives the drain pump **104** to discharge the used water is the tub **80** outside the washing machine via the drain hose **102**.

After completion of draining, rinsing and dewatering are successively executed. In this case, the dewatering is performed for removing water contents involved in the laundry by rotating the drum **80** at high rotational speed.

The laundry may gather to be entangled in the drum **80** while the washing, rinsing, or dewatering is in progress, whereby the transient vibration appears on the tub **70**.

Referring to FIG. **8**, when the tub **70** generating the front-to-rear transient vibration applies a shock to the second rotational body **140**, the second rotational body **140** pushes the second stopper **134** of the first rotational body **130**, the first and second rotational bodies **130** and **140** rotate centering around the second rotational connecting portion **131**, and the sensor **150** instantly senses the transient vibration of the tub **70**.

Namely, when the case **152** moves together with the second rotational body the ball **154** deviates from its normal position according to inertia thereof. Hence, the signal receiving part **154** receives the signal transmitted from the transmitting part **156** to transfer it to the control unit **170**.

The control unit **170** receives the signal transferred from the signal receiving part **154** to judge the transient vibration of the tub **70**. If it is judged as the transient vibration, the control unit **75** stops driving the motor **75**.

And, the respective rotational bodies **130** and **140** after such rotation and movement are returned to their original positions by the elastic force of the first coil spring **126**.

Referring to FIG. **9**, when right-to-left transient vibration of the tub **70** makes the protruding plate **76** applies a shock to the side plate **148** of the second rotational body **140**, the second rotational body **140** rotates centering around the fourth rotational connecting portion **140** and the sensor **150** instantly senses the transient vibration of the tub **70**.

In doing so, when the case **152** moves together with the second rotational body **140**, the ball **154** deviates from its normal position according to inertia thereof. Hence, the signal receiving part **154** receives the signal transmitted from the transmitting part **156** to transfer it to the control unit **170**.

The control unit **170** receives the signal transferred from the signal receiving part **154** to judge the transient vibration of the tub **70**. If it is judged as the transient vibration, the control unit **75** stops driving the motor **75**.

And, the second rotational body **140** after such rotation and movement are returned to its original position by the elastic force of the second coil spring **136**.

Meanwhile, the washing machine may lie on its back or side for repair or transportation. In such a case, the first or second rotational body **130** or **140** is rotated by the tub **70**, whereby the vibration sensing assembly **110** is prevented from being broken. When the washing machine is set upright, the first or second coil spring **126** or **136** returns the first or second rotational body **130** or **140** to its original position, thereby preventing malfunction of the vibration sensing assembly **110**.

Accordingly, the present invention has the following advantages or effects as follows.

First of all, the present invention instantly senses the transient vibration of the tub of the washing machine, thereby enabling to prevent the transient vibration.

Secondly, the present invention prevents the noise or movement, which is caused by the transient vibration of the tub, of the washing machine.

Thirdly, even if the washing machine lies on its back or side for transportation or repair, the present invention prevents the breakage of the vibration sensing assembly.

Finally, the present invention facilitates to install the sensor at the receiving portion of the second rotational body.

It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover such modifications and variations, provided they come within the scope of the appended claims and their equivalents.

What is claimed is:

1. A washing machine comprising:

a tub having an open front side;

a drum rotatably provided in the tub to hold laundry;

a motor rotating the drum;

a cabinet having the tub and the motor inside;

a control unit configured to control a vibration of the tub; and

a vibration sensing assembly configured to sense the vibration of the tub, the vibration sensing assembly comprising:

a fixing part fixed to an inner wall of the cabinet;

a first rotational body having a first end connected to the fixing part and configured to rotate a first predetermined range with respect to the fixing part so as to restrict a front to rear vibration of the tub;

a second rotational body having a first end being moveable by a vibration of the tub and a second end connected rotatably to a second end of the first rotational body, said second rotational body configured to rotate a second predetermined range with respect to the first rotational body so as to restrict an up and down vibration of the tub; and

a sensor configured to sense a rotational movement of at least one from the first and second rotational bodies.

2. The washing machine as claimed in claim **1**, wherein the fixing part comprises:

a fixing body fixed to the inner wall of the cabinet, a first rotational connecting portion connected in one body to the fixing body and rotatably connected to the first end of the first rotational body, and a first stopper provided to interrupt the rotational movement of the first rotational body so that the first rotational body only rotates within the first predetermined range.

3. The washing machine as claimed in claim **2**, wherein the first rotational connecting portion comprises an insertion hole in which a rotational center of the first rotational body is inserted.

4. The washing machine as claimed in claim **3**, wherein the fixing part further comprises a first elastic member returning the first rotational body to an original position.

5. The washing machine as claimed in claim **4**, wherein the first elastic member comprises a first coil spring having one end connected to the fixing body or the first stopper and the other end connected to the first rotational body.

6. The washing machine as claimed in claim **2**, wherein the fixing body is fixed to the inner wall of the cabinet by at least one hook.

7. The washing machine as claimed in claim **2**, wherein the first rotational body comprises:

a second rotational connecting portion rotatably connected to the first rotational connecting portion of the fixing part to be a rotational center; and

a rotational body having one end connected to the second rotational connecting portion to rotate according to the vibration of the tub centering around the second rotational connecting portion.

8. The washing machine as claimed in claim **7**, wherein the rotational body comprises a vibration transferring portion provided to an opposite side of the second rotational connecting portion to transfer the vibration of the tub to the rotational body.

9. The washing machine as claimed in claim **8**, wherein the first rotational body further comprises:

a second stopper configured to interrupt the rotational movement of the second rotational body so that the second rotational body only rotates within the second predetermined range; and

a third rotational connecting portion to which the second end of the second rotational body is rotatably connected.

10. The washing machine as claimed in claim **9**, wherein the first rotational body further comprises a second elastic member returning the second rotational body to its original position.

11. The washing machine as claimed in claim **10**, wherein the second elastic member comprises a second coil spring having one end connected to the second stopper and the other end connected to the second rotational body.

12. The washing machine as claimed in claim **11**, wherein the second rotational body comprises:

a fourth rotational connecting portion connected to the third rotational connecting portion to become a rotational center; and

a sensor receiving portion configured to receive the sensor therein.

13. The washing machine as claimed in claim **12**, wherein the sensor receiving portion is provided to an upper surface of the second rotational body.

14. The washing machine as claimed in claim **1**, wherein the sensor comprises:

a ball type rolling body moving in a reverse direction of a movement of the second rotational body according to the vibration of the tub;

a case providing a space for holding the rolling body; and

a movement sensing unit configured to sense a movement of the rolling body.

15. The washing machine as claimed in claim **14**, wherein a vertical cross-section of the inner space of the case is circular or oval.

16. The washing machine as claimed in claim **14**, wherein the movement sensing unit comprises:

a signal transmitting part provided to one side of an inner wall of the case; and

a signal receiving part provided to the other side confronting the signal transmitting part to receive a signal transmitted from the signal transmitting part.

17. The washing machine as claimed in claim **1**, wherein the vibration sensing assembly is coupled to the inner wall of a rear side of the cabinet in rear of the tub.

18. The washing machine as claimed in claim **17**, wherein the tub comprises:

a protruding plate provided in a vicinity of a lateral side of the rotational par, the protruding plate protruding in a rear direction to transfer a right-to-left vibration of the tub to the rotational part.

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